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The Extent of Shortages for Chlorine and Other Water Sanitation Chemicals

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SUMMARY REPORT :

THE EXTENT OF SHORTAGES FOR CHLORINE AND OTHER WATER SANITATION CHEMICALS

April, 1974



U.S. Environmental Protection Agency

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16. Abstracts Since June 1973 there have been a series of outage/shortage incidents for chlorine at water supply and wastewater utilities. Many other water treatment chemical shortages have also been reported. Relevant to this, the Environmental Protection Agency was requested to conduct a survey through its regional offices to determine the full extent of the problem. This report was prepared in response to these requests. It summarizes all of the reported outage/shortage incidents since June 1973 as well as the reports received in the January 1974 survey of the regional offices.			
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SUMMARY REPORT: THE EXTENT OF
SHORTAGES FOR CHLORINE AND OTHER
WATER SANITATION CHEMICALS

April, 1974

Water Supply Division
Office of Air and Water Programs
Environmental Protection Agency
Washington, D. C. 20460

Preface

Since June 1973 there have been a series of outage/shortage incidents for chlorine at water supply and wastewater utilities. A rash of other water treatment chemical shortages have also been reported.

Relevant to this, the Environmental Protection Agency was requested by Mr. Eric Johnson, Executive Director, American Water Works Association and Senator Warren G. Magnuson, Chairman of the Committee on Commerce United States Senate, to conduct a survey through its regional offices to determine the full extent of the problem.

This report was prepared in response to these requests. It summarizes all of the reported outage/shortage incidents since June 1973 as well as the reports received in the January 1974 survey of the regional offices.

Authorship and Acknowledgements

This report was compiled by Frank A. Bell, Jr. with the assistance of Harold M. Scott, Lehn J. Potter, and James E. Warren, all members of the Environmental Protection Agency Headquarters staff. Acknowledgement is given to the various water supply and wastewater engineers and scientists in the regional offices who have helped by furnishing the basic information.

Summary Report: The Extent of
Shortages for Chlorine and Other
Water Sanitation Chemicals

I. Summary

A. Chlorine

1. Seventy-five outage/shortage incidents were reported for wastewater and water supply utilities from 20 States from June 1973 - January 1974. Seventy-seven percent of the incidents were reported from the Eastern United States and none from the far-West, indicating that the shortage had regional characteristics.
2. Outages of bulk product supply were reported for six repackaging companies at branch plants in over 30 cities.
3. "Contract" and "predicted supply problems" for 1974 were cited for all but two regions and one of these indicated some contract problems.
4. Other factors reported as impacting on the chlorine supply situation were a "shortage of chlorine cylinders" by four regions and "transportation" delays by one region. These are viewed as serious aggravations to the main problem of a shortage of chlorine for water sanitation purposes.
5. Based on the supply problems experienced from June 1973 - January 1974, and on the "contract" and "predicted supply problems" forecast by the preponderance of the regions for 1974, the chlorine shortage must be considered as a serious threat to the Nation's public health. Market conditions, such as a decrease in industrial demand for chlorine could change this situation, but such conditions are not the subject of this paper.

B. Soda Ash, Lime and Caustic Soda

1. Currently lime and caustic soda must be considered tight but not critically short; no incidents were reported for lime and only three shortage incidents for caustic soda.
2. Thirty-six incidents were reported for soda ash, mostly in the midwest States and there appear to be many more shortage problems than were reported; soda ash must be considered as critically short for water treatment. This situation is mitigated by two facts; many utilities have been able to substitute lime and/or caustic soda for soda ash and the health implications for an outage of soda ash are less than for chlorine. However, there still are health implications and a continuing shortage situation for soda ash merits serious governmental concern.

C. Other Water Sanitation Chemicals

1. Some degree of outage, shortage or problems with contracts or supply for 1974 were reported for fluoridation chemicals, activated carbon, alum, ferric chloride, ferrous sulfate and methanol.
2. The problems with regard to fluoridation chemicals appear to be caused by local and regional maladjustments, rather than being national in scope. The problems with regard to activated carbon lie mainly in difficulties in obtaining contracts and in predicted short supply for 1974; however, a more expensive industrial-grade activated carbon is available for substitution to help solve critical water quality problems. The reported incidence of problems with the other chemicals was too small to be considered significant.

II. Chlorine

Chlorine is the most important water treatment chemical. It is used to disinfect drinking water to prevent the occurrence of epidemic disease outbreaks such as hepatitis, typhoid fever, gastroenteritis, and others. It is used to disinfect wastewater to reduce fecal coliform levels to legally mandated levels; this is particularly important where wastewater effluents may impact on recreational waters or shellfish growing waters or on public water supply intakes.

A. Outages/Shortages (June 1973 - January 1974)

1. Water and Wastewater Utilities - A summary of Table 1 reveals utility outages/shortages (incidents) for chlorine from June 1973 - January 1974 as follows:

<u>Utility</u>	<u>Outages</u>	<u>Shortages</u>	<u>Total</u>
Water Supply	1	25	26 (35%)
Wastewater	22	27	49 (65%)
Total	23	52	75 (100%)

There is a general recognition that it is more important to disinfect drinking water than wastewater; this is reflected in the greater number of incidents for wastewater than for water supply. In several shortage situations chlorine has been diverted from wastewater uses to drinking water disinfection.

Most of the reported incidents occurred in the Summer and Fall of 1973 when water sanitation demands for chlorine were at a high level. It was expected that incidents would disappear in the Winter and that repackaging companies and utilities would be able to build up their chlorine reserves since water sanitation demands would be low at this time. However this did not occur; during the Winter period, repackers reported a worrisome continuation of bulk-supply problems and about one-third of the utility incidents were reported for the Winter period.

In considering the reported incidents, it must be remembered that the general problems of supply were experienced by many cities in the affected States in addition to the reported incidents. Incidents were reported for utilities in 20 States; it is likely that the number of utilities experiencing supply problems was many times the number of reported incidents.

2. Repackaging Companies - No special effort has been made to survey supply problems among repackaging companies but information has come to our attention through a variety of sources which indicate outages (interpreted as no tank car at the repackaging plant for unloading) for six companies at branch plants in over 30 cities. One company reported that 16 of its branch plants had run out of chlorine upon two or more occasions during the last year.

An outage of chlorine at a repackaging plant is a good indicator for problems to come. If the repackager has difficulty in obtaining chlorine, this difficulty will subsequently be reflected by short supplies and outages for water and wastewater utilities. As mentioned before, it has also been worrisome to discover that repacker supply problems have continued into the Winter months when sanitation demands are low.

B. Regional Aspects and Signs of Problems for 1974

Examination of Table 2 reveals that 77% of the outage/shortage incidents came from the East, 20% from the Central States, and only 3% from the West. Significantly no supply problems were reported for the far-West. The greatest density of incidents occurred in Region II (New York and New Jersey). From this it is clear that the chlorine shortage has definite regional characteristics as well as being a general National problem.

Examination of the future, in this paper, depends entirely on the reports and impressions of the State and utility representatives. A few have had written notices from their suppliers but most have only had verbal notices or rumors, or have had the experience of receiving inadequate or no bids on their chlorine supply for 1974. A summary of the information in the last column of Table 2 reveals the following:

1. "Contract" problems reported by nine EPA regions: This is the most pervasive sign of a National problem; its nature varies from no bids received to the signing of qualified contracts. Many utilities are currently operating on little more than an agreement that the repackager will furnish chlorine, if he has it, at a price which may vary with the current market conditions.
2. "Predicted supply problems" reported by eight regions: This sign represents a translation of the repackaging companies' predicament to the utilities. During the shortage so far, repackaging companies report that they have been put on reduced allocations by some producers and have received notices of continued and sometimes even lower allocations for 1974; one repackager has even had his entire contract dropped for 1974 by a producer. This has generated a number of written and verbal warnings of supply problems for 1974.
3. "Shortage of chlorine cylinders" reported by four regions: This represents an aggravation to the general situation; the supply of cylinders, though tight, would be adequate if chlorine weren't so short. Many repackagers are putting substantial deposits on cylinders to help regulate their turn-around and for economic reasons.
4. "Transportation delays" reported by one region: Unofficially these delays have also been reported at other times by a number of regions. Again, while the chlorine supply is tight, mishaps and mis-routings on the railroad can have painful results.

5. Based on the supply problems experienced from June 1973 - January 1974, and on the "contract" and "predicted supply problems" forecast by the preponderance of the regions for 1974, the chlorine shortage must be considered as a serious threat to the Nation's public health. Market condition, such as a decrease in industrial demand for chlorine could change this situation but such conditions are not the subject of this paper.

III. Soda Ash (Na_2CO_3), Lime (CaO) and Caustic Soda (NaOH)

These chemicals are grouped together since they have similar properties in water treatment: pH adjustment for corrosion control and as an assist in coagulation; and softening. In certain instances water utilities have switched from an unavailable chemical to another but this cannot always be done easily because of differences in feeding equipment; also the two chemicals may not do exactly the same job and one may be more hazardous to handle than another.

Table 4 lists the outage/shortage incidents for soda ash, lime and caustic soda; the only reported incidents were for water supply, none for wastewater treatment. The situation for lime is currently much improved over the Summer of 1973 when there was a strike of a major lime producer; in fact the lime supply must now be considered tight but not short.

Only three shortage incidents were reported from two regions for caustic soda. However short supply conditions were mentioned by two additional regions. Caustic soda is a twin product of the electrolytic process which is used to make chlorine; as the productive capacity for chlorine goes up, the availability of caustic soda will also increase.

Soda ash is in the shortest supply of these three chemicals. Thirty-six incidents have been reported from ten States located in six regions. Table 4 gives the regional breakdown for soda ash. The East, Central and West areas all had a similar percent of incidents for soda ash but a closer examination of the States involved reveals the highest density of problems to be in the midwest with no problems at all reported in Region VI or in the far-west Regions of IX and X.

For soda ash the reported incidents represent only the tip of the iceberg because many utilities have switched to lime or caustic soda or have had to content themselves to deliver a lower quality water (usually in terms of hardness) to their customers. Since the health implications of an outage for soda ash are less than for chlorine, there has been less attention paid to this problem than for chlorine.

However there may be health ramifications for a soda ash outage. Lack of proper pH control could be detrimental to good coagulation and clarification, and could also cause a greater pickup of trace metals, including lead from the distribution systems, thus leading to concentrations of trace metals in drinking water which are higher than the health limits set forth in the Federal Drinking Water Standards. Lack of softening could give an aesthetically displeasing water which might cause some consumers to seek an alternate, possibly less-safe source of water. Consequently a continuing shortage situation for soda ash merits serious governmental concern.

On the basis of utility and State reports the future for soda ash does not look good. Six out of ten regions reported "contract" and "predicted supply problems" for 1974.

IV. Other Water Sanitation Chemicals

A. Less problems were reported with respect to the other water sanitation chemicals; of these only two categories were of significant extent as follows:

1. Fluoridation Chemicals - These chemicals are used to impart an optimum concentration of fluoride to drinking water as a means of preventing dental decay. A short-term suspension of fluoridation (less than a couple of weeks) may have little impact on dental protective effects but long term outages could significantly impair dental protection.

Spot outage/shortage incidents and problems have been reported around the nation as follows:

- Sodium Fluoride (NaF): Outages at Durham, New Hampshire and Hanover, New Hampshire.
- Sodium Silicofluoride (Na_2SiF_6): Outages at two plants at Miami-Dade County, Florida.
- Fluosilicic Acid (H_2SiF_6): Shortage (down to 1-10 days supply) at New Brunswick, New Jersey and reported supply difficulties in Region VII.

It is believed that these supply problems reflect local and regional maladjustments rather than a National shortage situation. No indication was made by any of the regions of "contract" or "predicted supply problems" for 1974.

2. Activated Carbon (C) - Activated carbon is used to remove organic substances from drinking water principally for taste and odor control; the shortage problems pertain to the powdered form for water treatment while the granular form is not really short. No outages or shortages were reported but three regions reported "contract" and "predicted supply problems" for 1974.

The principal difficulty revolves around a major producer which has temporarily suspended operations during a significant change in processes. According to this producer, the turnaround time may take six months; consequently it has quit bidding on new business and will ship product from its stockpile only upon a clearcut need. It has urged its customers to conserve activated carbon, using it only to solve specific problems rather than routinely.

If activated carbon for water treatment should become unavailable for solving critical problems, utilities still have the option of ordering a more expensive industrial grade of activated carbon which is reported to be in adequate supply.

3. Other Chemicals - Single reports of supply problems have been made for a variety of other chemicals as follows:
 - a. Alum ($\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O}$) water treatment, shortage (down to 1-10 days supply): Graniteville County, South Carolina.
 - b. Ferric Chloride (FeCl_3) wastewater solids treatment: Difficulty in purchasing in Iowa.
 - c. Ferrous Sulfate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) water treatment, supply problems: Missouri.
 - d. Methanol (CH_3OH) wastewater treatment, shortage (down to 1-10 days supply): Happaug County Plant, New York.

While these reports reflect an element of concern, they do not seem to indicate any serious supply problems.

TABLE 1

SUMMARY LIST OF UTILITIES REPORTED AS
EXPERIENCING OUTAGES/SHORTAGES OF CHLORINE

(June 1973 - January 1974)

I. Outages

A. Public Drinking Water Supplies

1. Lander, Wyoming

B. Wastewater Treatment Plants

1. Binghamton-Johnson City, New York
2. Borough of Florence, New Jersey
3. Corinna, Maine
4. Dallas, Texas
5. Des Moines, Iowa
6. Glenn Falls, New York
7. Greenville, Tennessee
8. Houston, Texas (Stopped using Hypochlorite at one plant for various periods totalling 421 hours).
9. Jacksonville, Illinois
10. Jefferson Parish, Louisiana
11. Kalamazoo, Michigan
12. Kings Park, New York
13. Mattabassett Sanitary District, Connecticut
14. Monticello, Illinois
15. Nashville, Tennessee
16. New York City, New York (Stopped chlorinating at four plants to conserve the hypochlorite for use on its other effluents).
17. Orono, Maine
18. Plattsburgh, New York
19. Rangely, Maine
20. Scotia, New York
21. Smithtown, New York
22. St. Joseph's Resort, Illinois

II. Shortages (down to 1-10 days supply)

A. Public Drinking Water Supplies

1. Boynton Beach, Florida
2. Brunswick, Georgia
3. Chicago, Illinois
4. Clearwater, South Carolina
5. Denver, Colorado
6. Greenville, South Carolina

TABLE 1 (continued)

7. Indianapolis, Indiana
8. Isle of Palms, South Carolina
9. Jan-Phyl Subdivision (Polk County), Florida
10. Lancaster, Pennsylvania
11. Middlesex, New Jersey
12. Newark, New Jersey
13. New York City, New York
14. North Jersey District, New Jersey
15. Palm Beach County, Florida (1st System)
16. Palm Beach County, Florida (2nd System)
17. Palm Springs, Florida
18. Philadelphia, Pennsylvania
19. Pinellas County, Florida
20. Savannah, Georgia
21. St. Augustine, Florida
22. Summerville, South Carolina
23. Wellsboro, Pennsylvania
24. Wilmington, Delaware
25. Wilmington, Suburban District, Delaware

B. Wastewater Treatment Plants

1. Algonquin, Illinois
2. Avon, New York
3. Babylon, New York
4. Barrington, Illinois
5. Bayshore, New York
6. Buffalo, New York
7. Colonie, New York
8. Detroit, Michigan
9. Elmira, New York
10. Endicott, New York
11. Granville, New York
12. Hoboken, New Jersey
13. Hudson, New York
14. Jersey City, New Jersey
15. Laconia, New Hampshire
16. Little Falls, New York
17. Middlesex County, New Jersey
18. Orangetown, New York
19. Peterborough, New Hampshire
20. Richmond, Illinois
21. Rochester, New York
22. Round Lake Sanitary District, Illinois
23. Tupper Lake, New York
24. Utica, New York
25. Verson, New York
26. Wellsboro, Pennsylvania
27. Western Electric Co., Andover, Massachusetts
(Sanitary wastes)

TABLE 2

REGIONAL SUMMARY OF CHLORINE OUTAGE/SHORTAGE INCIDENTS
(June 1973 - January 1974) and
REPORTED SIGNS OF PROBLEMS (for 1974) FOR WATER AND WASTEWATER UTILITIES

<u>Regions</u>	<u>No. of Outages</u>	<u>No. of Shortages</u>	<u>No. of Outages & Shortages</u>	<u>% of National Total</u>	<u>Signs of Problems for 1974</u>
<u>East</u>					
Region I (CT,ME,MA,NH,RI,VT)	4	3	7	9	Contract, predicted supply problems; shortage of chlorine cylinders.
Region II (NJ,NY,PR,VI)	8	22	30	40	Contract, predicted supply problems; transportation delays.
Region III (DE,MD,PA,VA,WV,DC)	0	6	6	8	Contract, predicted supply problems.
Region IV (AL,FL,GA,KY,MS,NC,SC,TN)	2	13	15	20	Contract, predicted supply problems.
Subtotal	14	44	58	77	
<u>Central</u>					
Region V (IL,IN,MI,MN,OH,WI)	4	7	11	15	Contract, predicted supply problems.
Region VI (AR,LA,NM,OK,TX)	3	0	3	4	Contract, predicted supply problems; shortage of ton cylinders.
Region VII (IA,KS,MO,NB)	1	0	1	1	Contract, predicted supply problems; shortage of ton cylinders.
Subtotal	8	7	15	20	
<u>West</u>					
Region VIII (CO,MT,ND,SD,UT,WY)	1	1	2	3	Contract, predicted supply problems.
Region IX (AZ,CA,HI,NV, Amer. Samoa Guam, Trust Territories of Pacific Islands, Wake Island)	0	0	0	0	Contract problems.
Region X (AK,ID,OR,WA)	0	0	0	0	Shortage of Chlorine Containers.
Subtotal	1	1	2	3	
TOTAL	23	52	75	100%	

TABLE 3

SUMMARY LIST OF UTILITIES REPORTED AS
EXPERIENCING OUTAGES/SHORTAGES FOR
SODA ASH, LIME AND CAUSTIC SODA

I. Soda Ash (Public Drinking Water Supplies Only)

A. Outages

1. Ames, Iowa
2. Des Moines, Iowa
3. Forest City, Iowa
4. Fort Wayne, Indiana
5. Graffen, North Dakota
6. Jamestown, Rhode Island
7. Mahoning Valley Sanitary District, Ohio
8. Perth Amboy, New Jersey
- 9- West Virginia: ten or more unidentified
18. supplies.

b. Shortages (down to 1-10 days supply)

1. Aberdeen, South Dakota
2. Arkansas City, Kansas
3. Beresford, South Dakota
4. Britten, South Dakota
5. Carbondale, Kansas
6. Chanute, Kansas
7. Greenville, South Carolina
8. Iola, Kansas
9. Lawrence, Kansas
10. Mitchell, South Dakota
11. Murdo, South Dakota
12. North Augusta, South Carolina
13. Russel, Kansas
14. Springfield, South Dakota
15. Vermillion, South Dakota
16. Webster, South Dakota
17. Wessington-Spring, South Dakota
18. Winfield, Kansas

TABLE 3 (continued)

II. Lime

A. Outages

None

B. Shortages

None

III. Caustic Soda

A. Outages

None

B. Shortages (Public Drinking Water Supplies, down to 7-10 days supply)

1. Cheraw, South Carolina
2. J.B. Stevens - Utica Mohawk, South Carolina
3. St. Albans, Vermont

TABLE 4

REGIONAL SUMMARY OF SODA ASH OUTAGE/SHORTAGE
INCIDENTS AS OF JANUARY 1974 AND REPORTED SIGNS OF
PROBLEMS FOR 1974 FOR WATER SUPPLY UTILITIES

<u>Regions</u>	<u>No. of Outages</u>	<u>No. of Shortages</u>	<u>No. of Outages & Shortages</u>	<u>% of National Total</u>	<u>Signs of Problems for 1974</u>
<u>East</u>					
Region I (CT,ME,MA,NH,RI,VT)	1	0	1	3	Contract, predicted supply problems.
Region II (NJ,JY,PR,VI)	1	0	1	3	---
Region III (DE,MD,PA,VA,WV,DC)	10	0	10	28	Contract, predicted supply problems.
Region IV (AL,FL,GA,KY,MS,NC,SC,TN)	0	2	2	5	Contract, predicted supply problems.
Subtotal	12	2	14	39	
<u>Central</u>					
Region V (IL,IN,MI,MN,OH,WI)	2	0	2	5	Contract, predicted supply problems.
Region VI (AR,LA,NM,OK,TX)	0	0	0	0	---
Region VII (IA,KS,MO,NB)	3	7	10	28	Contract, predicted supply problems.
Subtotal	5	7	12	33	
<u>West</u>					
Region VIII (CO,MT,ND,SD,UT,WY)	1	9	10	28	Contract, predicted supply problems.
Region IX (AZ,CA,HI,NV, Amer. Samoa, Guam, Trust Territories of Pacific Islands, Wake Isl.)	0	0	0	0	---
Region X (AK,ID,OR,WA)	0	0	0	0	---
Subtotal	<u>1</u>	<u>9</u>	<u>10</u>	<u>28</u>	
Total	18	18	36	100%	